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SELECTED REFERENCES OF GENERAL INTEREST TO FISHERY SCIENTISTS (1976-77)

compiled by

Research Information Unit
Fishery Resources and Environment Division

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, October 1977

PREPARATION OF THIS DOCUMENT

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INTRODUCTION

Each year a flood of papers and other documents report the results of scientific investigations in fisheries and other branches of aquatic science. In 1976 some 13967 items were entered into the bibliographic data base of the Aquatic Sciences and Fisheries Information System (ASFIS). With the aid of modern information processing technology, systems are being developed whereby it should be relatively easy to locate, within this flood, those documents dealing with well defined topics. For example, any information about the growth of cod in the North Sea will be found in documents indexed simultaneously under "Growth", "*Gadus morhua*" and "North Sea". Most documents are of this type, dealing with a particular topic, each being of interest only to those specialists directly concerned with that topic.

In addition, there are papers of more general interest - for example because they introduce a technique or method of analysis that can be applied in different situations. It is not always easy for scientists, particularly those in small institutions without access to modern information systems, to become aware of such papers which, while dealing with topics not immediately or obviously connected with their work, are of considerable potential value.

FAO has therefore compiled a list of such papers which came to the notice of the staff of the Fishery Resources and Environment Division during 1976/77, and which are believed to be of general interest. The choice has inevitably been subjective; certainly many papers that are of general interest, and could have been selected by other persons, have been omitted.

The present selection is experimental; if found useful a selection will be produced regularly, hopefully with a wider input to the selection of papers. FAO would therefore be grateful for comments on the usefulness of this type of selected bibliography, as well as for suggestions for inclusions in later listings. These should be sent to:

Research Information Unit
Fishery Resources and Environment Division
FAO, Via delle Terme di Caracalla
00100 Rome, Italy

00001

Ad hoc Meeting on the Provision of Advice on the Biological Basis for Fisheries Management, Charlottenlund (Denmark)
Report of the ad hoc Meeting on the Provision of Advice on the Biological Basis for Fisheries Management, Charlottenlund, 5-9 January 1976

- Ad hoc Meeting on the Provision of Advice on the Biological Basis for Fisheries Management - Charlottenlund (Denmark) - 5 Jan 1976 - Charlottenlund (Denmark) - ICES - Feb 1977 - 16 p. - 3 figures; 2 tables; 2 appendices - (En)

Coop.Res.Rep.ICES - (no.62)

/conferences/ /potential yield/ /fishery management/ /stock assessment/ /methodology/ /ANE/. This report contains appropriate definitions and gives a critical review of the concept of Maximum Sustainable Yield (MSY). An integrated objective, containing a buffer stock, which size should be maintained at a sufficiently high level so that its variation due to recruitment is reduced. The buffer stock concept is particularly valid for longlived spp. Thus the new Optimum Sustainable Yield (OSY) may be calculated, and will often be less than the MSY. The use of the OSY in management is considered. Present states of the major fish stocks in the Northeast Atlantic (NEAFC) area are briefly reviewed. Some research problems are noted and guidelines are presented for Working Groups .

00002

FAO Fishery Committee for the Eastern Central Atlantic, Rome (Italy). Working Party on Resource Evaluation
Evaluation of the fishery resources of the Eastern Central Atlantic. Report of the Third Session of the Fishery Committee for the Eastern Central Atlantic. Working Party on Resource Evaluation. Rome 9-16 February 1976

FAO-FIRD/R--183
ISBN 92-5-200085-2 (Fr)
ISBN 92-5-100085-9 (En) - 3.Sess.Fishery Committee for the Eastern Central Atlantic - Rome (Italy) - 9 Feb 1976 - Rome (Italy) - FAO - 1976 - 135 p. - (En; Fr)

FAO Fish.Rep. - (1976) - (no.183)

/stock assessment/ /fishery resources/ /fish catch statistics/ /ASE/ /fishery management/ /marine fisheries/. The Working Party reviewed the present state of exploitation of stocks and management requirements, and studied data collection and compilation processes and future work. Included as appendixes are the various background and working documents presented at the meeting, dealing with demersal resources off the coast of the Congo, research activities in the Ivory Coast, Japanese activities in the region, studies on Sepia egg clusters, Polish fishing activities, population parameters of the Saharan coast sardine, the Portuguese trawl fishery in the region, the activities of the Spanish fishing fleet, catch and effort statistics etc. from the Spanish cephalopod fishery in the region, and research activities in Nigeria .

00003

Organization for Economic Cooperation and Development, Paris (France)
[Economics of small-scale fisheries] Economie des petites peches

OECD-FI--159
OCDE-FI--159 - Conference on Policies and Problems related to small-scale fisheries - Paris (France) - 26 Nov 1975 - Paris (France) - OECD - 1976 - (En; Fr)

The proceedings of a /conference/ held on /artisanal fisheries/ .

00004

Bardach, J.E.
Aquaculture revisited

- 13.Pacific Science Congress. Aquaculture Symposium - Vancouver (Canada) - 18 Aug 1975 - (En; en, fr)

J.Fish.Res.Board Can. - (1976) - 33(no. 4, pt. 2), 880-887

/aquaculture/ /aquaculture development/ /Asia/. Opportunities for and constraints of animal aquaculture are considered w. spec. ref. to the Pacific basin. Coice of spp for husbandry depends on biological, cultural and marketing factors. Seed production may be centralized with some economy of scale, even in artisanal enterprises, provided distribution facilities for postlarvae are made. Larval survival for several cultivars still needs enhancement. Practices for growout phase of aquatic stock differ, depending on the intensity of fixed and variable inputs. For much of tropical Asia best expansion opportunitiesexist in managed pasturage polyculture possibly continuing the growout of Crustacea for export with local. largely herbi- and plankti-vorous semistaple spp.

00005

Brennan, J.A. Palmer, J.E.
Variability of 'q' as measured by variation in daily catch and effort

ICNAF--76/VI/106
ICNAF--76/VI/117 - 26. Annu.Meeting ICNAF - Montreal (Canada) - 31 May 1976 - (En; en)

Sel.Pap.ICNAF - (1977) - (no.2), 111-136

/catch per unit effort/ /fishing effort/ /Germany, Fed.Rep./ /ANE/ /Japan/ /statistical analysis/ /fishing vessels/ /fishing power/. Daily catch and effort records of tonnage class 7 (1801 GT) vessels from west Germany, Japan and Poland, fishing in ICNAF Division 5Z and stat. area 6 in 1971-3 were examined for variability in catchability. A generalized linear covariable model was hypothesized with hrs fished as a covariable, and yr, season, 30 x 30 min unit area, and vessel as factors. the implication of results is that in some cases a proposed reduction in fishing mortality would not be achieved by a pptnl.reduction in days fished. calcs. of the fishing power of indiv. vessels showed gt. variation in the fishing power of the vessel in a fleet regardless of which vessel was used as the std. vessel.

00006

Brothers, E.B. Mathews, C. Lasker, R.
Daily growth increments in otoliths from larval and adult fishes

- (En; en)

Fish.Bull.NOAA/NMFS - (1976) - 74(1), 1-8

/otolith reading/ /fish larvae/ - /aging methods/ /methodology/ /growth/ /seasonal variations/ Daily growth increments have been found in otoliths of fish larvae. The daily nature of these layers was verified by examining larval fish of known age reared in the lab. A simple technique for observing these marks is described and can be used on otoliths from larvae and adults. This provides a convenient method for determining early growth in fishes and is particularly useful for fishes which do not lay down annual or seasonal rings .

00007

Cram, D.L. Hampton, I.
A proposed aerial/acoustic strategy for pelagic fish stock assessment

- (En; en)

J.Cons.CIEM - (1976) - 37(1), 91-97

/stock assessment/ /methodology/ /aerial surveys/ /bias/ /echo surveys/ /Sardinops ocellata/ /ASE/. Aerial and acoustic observations on Sardinops ocellata shoals in the Southeast Atlantic show that the extreme patchiness of the shoals, the mobility of the fish and their tendency to avoid vessels, may invalidate the results of quantitative acoustic surveys on the stock. It is suggested that these survey errors can be reduced considerably by employing an aerial/acoustic strategy where the aircraft locates and measures the shoal area, and the vessel makes synchronous measurements of shoal thickness and packing density from as many shoals as possible. The combined data provide a direct estimate of stock size .

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C0008

Coulter, G.W.
The biology of Lates species (Nile perch) in Lake Tanganyika, and the status of the pelagic fishery for Lates species and Luciolates stappersii (Blgr.)

- (En; en)

J.Fish.Biol. - (1976) - 9(3), 235-259

/Lates/ /population characteristics/ /fishery biology/ /lake fisheries/ /inland fisheries/ /life cycle/ /Tanganyika L./ /Zambia/ /Burundi/ /population dynamics/ /Luciolates/ /fishery management/. Lates mariae, microlepis and angustifrons, and L. stappersii (which belongs to a monotypic gen) were studied. They are principal predators in the pelagic and benthic fish communities. Data are presented on distribution, growth, length-wt, condition, reproduction and feeding. the Lates spp appear highly susceptible to intensive fishing by purse seines and have been fished up in the southeast arm in Zambia and in the burundi sector, where only small populations remain. There has been a resulting increase in clupeid biomass. A simplified community consisting mainly of clupeids and Lates is forseen. Equilibrium between the spp will be determined mainly by year selectivity and fishing stress.

00009

Cushing, D.H. Dickson, R.R.
The biological response in the sea to climatic changes

- includes bibliography, p.111-122 - (En)

Adv.Mar.Biol. - (1976) - (14), 1-122

This /review/ presents a thorough account of biological aspects of /weather conditions/. Deals with effects on a regional basis as well as with particular /environmental factors/. Particular sections are devoted to /waves/, /weather anomalies/, /upwelling/, and seasonal variations. Also discussed are the /Greenland/ /marine fisheries/ for cod, /Gadus/, /recruitment/, the effects of cold winters, and changes in the /Baltic Sea/ .

00010

Doubleday, W.G.
Environmental fluctuations and fisheries management

ICNAF--75/IX/134 - 7.Special Commission Meeting ICNAF - Montreal (Canada) - Sep 1975 - (En; en)

Sel.Pap.ICNAF - (1976) - (no. 1), 141-150

/fishery management/ /mathematical models/ /biomass/ /catch per unit effort/ /yield/. The effect of random fluctuations in production on the success of fisheries management schemes in examined using a discrete version of Schaefer's (1954) model. Control of stock biomass, catch, and effort are considered. The average yield taken is shown to be inversely related to yearly fluctuations in yeild. Control of stock biomass maximizes the average yield at the cost of large fluctuations in catch. Control of catch requires a large reduction in average yield to obtain stability. The effects of controlling effort lie between those of controlling biomass and controlling catch . The restoring force of an exploited stock to deviations from equilibrium is examined and the presence of a critical zone of biomass less than one fourth of the virgin biomass in which further displacement weakens the restoring force and from which recovery of stock biomass is slow is noted. It is shown that control of effort at a level corresponding to an equilibrium biomass of two thirds the virgin stock instead of one half as is commonly recommended achieves a reduction in catch variance of from 60% to 75% and an increase of catch per unit effort of 33-1/3% with a loss in yield of 11% . The biomass buffer between equilibrium biomass and the critical zone is increased 133%, making the stock more resilient to depletion by a succession of weak year classes and reducing the need for rapid changes of regulations based on preliminary estimates of incoming year-class strength .

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00011

Fonteneau, A. Pianet, R.
[Analysis of the condition of the East Atlantic yellowfin tuna fishery] Analyse de la situation de la pecherie d'albacore de l'Atlantique de l'est

- (Fr; en, fr)

Can.OcSTCM (Oceanogr.) - (1976) - 14(2), 129-138

/stock assessment/ /ASE/ /ANE/ /thunnus albacares/ - /mathematical models/ /simulation/ /recruitment/ /fishery management/. The status of the yellowfin (Thunnus albacares) fishery in the eastern Atlantic is analysed using the most recent statistical information up to Sep 30th 1975. The production model (W. FOX) and multigear simulation model (A. FONTENEAU) are both used. The production model gives conclusions highly variable both according to the input data (catch and catch per unit effort) and from the view point of the parameters of the model (K and m) . Analytical simulation allows a better understanding of the status of the fishery and gives more precise answers upon its future according to hypotheses on fishing effort. A rapid increase in fishing effort explains the large catches observed during 1974 and 1975. During 1975 a poor year class (born in 1974) has been recruited, and the availability of large yellowfin has been high in connection with some new offshore fishing areas. Any additionnal effort beyond the present level will increase the desequilibrium of this fishery and could lead the stock into a biologically dangerous condition .

00012

Gulland, J.A.
Food and Agriculture Organization of the United Nations, Rome (Italy)
Goals and objectives of fishery management

FAO-FIRS/T166
ISBN 92-5-200281-2
ISBN 92-5-100281-9
ISBN 92-5-300281-6 - Rome (Italy) - FAO - 1977 - 14 p. - 15 ref.; 3 fig.; English ed. Also issued in French and Spanish. Fr. ed.: Buts et objectifs de l'amenagement des peches. Es ed.: Metas y objectivos de la ordenacion pesquera - (En, Es, Fr; en, es, fr)

FAO Fish.Tech.Pap. - (no.166)

/fishery management/ /methodology/ /potential yield/. This paper discusses the problems of determining what should be the aims and objectives to be pursued when managing fisheries. The concept of maximum sustained yield (MSY) has proved useful in simple situations. A less narrowly defined objective is needed to take account of interactions between different fisheries and fish stocks; of measures of output (economic return, employment, etc.) other than the simple weight harvested; of the inputs (fuel, energy, etc.) involved in taking the catch; and of the need to balance immediate and long-term interests (i.e., between catching more fish now, and having more to catch next year or the year after) . It is probably not possible to replace MSY by a single, simply defined objective that satisfies all these conditions. In practice management policies will have to be determined in each case in the light of current objectives of society, and of the scientific understanding of the stocks, bearing in mind that they will never be completely accurate. Some of the problems of providing scientific advice in a way that appropriate management decisions can be taken are discussed. Problems of stock and recruitment, interaction between species, and inherent variability of natural systems are likely to present particular difficulties .

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00013

Hilborn, R. Walters, C.J.
Differing goals of salmon management on the Skeena River

- (En; en, fr)

J.Fish.Res.Board Can. - (1977) - 34(1), 64-72

/fishery management/ /methodology/ /Salmonidae/ /Skeena R./. In this paper we describe the use of a specific decision analysis tool, multiattribute utility analysis, to investigate conflicting goals in the management of salmon on the Skeena River. We used this technique to determine the preferences of 10 individuals representing several interest groups and different management agencies. It is shown how individuals differ in their preferences, how conflicts can be identified, and how decision analysis can be used to refine an individual's understanding of his preferences. Individuals assessed possible outcomes of different alternative enhancement proposals using two techniques, the decision analysis technique and an intuitive approach. These two methods produced different results. The use of these techniques in the management process is discussed .

00014

Horwood, J.W.
Interactive fisheries: a two species Schaefer model

ICNAF--75/IX/125 - 7.Special Commission Meeting ICNAF - Montreal (Canada) - Sep 1975 - (En; en)

Sel.Pap.ICNAF - (1976) - (no. 1), 151-155

/mathematical models/ /fishing effort/ /potential yield/ /fishery management/. A 2 spp fishing model is considered and compared with the results from a grouped Schaefer model. If fishing effort is proportional to the relative number of each sp, then it is shown that the correspondence between the 2 models diverges as the ratio of the 2 spp diverges from unity. It is also shown that fishing each sp in proportion to their relative numbers does not necessarily take the fishery through its maximum sustainable yield .

00015

Hunter, J.R. (ed)
Colloquium on Larval Mortality Studies and their relation to Fishery Research, Seattle, WA (USA)
Report of a colloquium on larval fish mortality studies and their relation to fishery research, January 1975

NOAA/NMFS-TR-CIRC--395 - Colloquium on larval fish mortality studies and their relation to fishery research - [n.p.] - Jan 1975 - (En; en)

NOAA Tech.Rep.NMFS Circ. - (1976) - (no. 395)

/recruitment/ /fish larvae/ /mortality/ /population dynamics/. One of the critical problems in fishery research today is the inability to determine how the abundance of adult fishes affect the strength of incoming year classes. The report summarizes the discussions of experts on how studies of larval fish mortality may assist in solving this problem. Included in this report are discussions of the principle causes of larval mortality and their possible relation to stock size. Guidelines and recommendations are made regarding future research on the mortality of larval fish .

00016

Jones, D.D. Walters, C.J.
Catastrophe theory and fisheries regulation

- (En; en, fr)

J.Fish.Res.Board Can. - (1976) - 33(12), 2829-33

/systems analysis/ /fishery management/ /fishing gear/ /fishery regulations/. Catastrophe theory is a mathematical approach for analyzing systems that show abrupt changes. This paper attempts to apply the theory to fishery development and collapse, where the key variables are assumed to be stock size, level of economic investment or fleet size, and technological efficiency of the fishery gear. The analysis produces no new predictions about uncontrolled development and its consequences, but it appears to provide a useful way of exploring the implications of regulatory policies involving taxation, development subsidies, and technological improvement .

00017

Kerr, S.R. Neal, M.W.
Analysis of large-scale ecological systems

- (En; en, fr)

J.Fish.Res.Board Can. - (1976) - 33(9), 2083-2089

/systems analysis/ /ecology/ /ecosystems/ - /models/ /data base management/. Large spatial and temporal scales imply a proportional need for large volumes of data. Ecological systems exhibit different patterns of variability as a function of scale. It follows that large-scale ecological systems are appropriately observed at a number of different spatial and temporal scales, further complicating the data requirements for various kinds of analysis. The concept of an "information model," in conjunction with an effective data base management system, enables an analytical approach to large-scale ecological systems that is relatively unconstrained by preconceived organizational structures in the data base .

00018

Larkin, P.A.
An epitaph for the concept of maximum sustainable yield

- American Fisheries Society Annual Meetings - Dearborn, MI(USA) - 19 Sep 1976 - 43 ref. - (En)

Trans.Am.Fish.Soc. - (1977) - 106(1), 1-11

/potential yield/ /yield predictions/ - /optimum sustainable yield/ /reviews/. The concept of Maximum Sustainable Yield (MSY) has been reducing in popularity, to be replaced by the concept of Optimum Sustainable Yield (OSY). In this paper the author discusses the history of the use of MSY as a tool in fishery management, reviewing several works of importance on MSY. The biological complications caused by the use of MSY are discussed, and also its economic implications. The introduction of the OSY concept is also considered, and the options available for the future. MSY, in particular, is not attainable for single spp and must be compromised, (1) to reduce the risk of catastrophic decline and reduction of genetic variability, and (2) to accomodate the interactions among the spp of organisms that comprise aquatic communities .

00019

Laurec, A.
[Analysis and estimation of fishing power]
Analyse et estimation des puissances de peche

- 11 ref.; 4 annexes - (Fr; en)

J.Cons.CIEM - (1977) - 37(2), 173-185

/catch per unit effort/ /statistical analysis/ /fishing vessels/ - /fishing power/ Sixty trawlers of over 12.2 m in length landed demersal fish at Brixham, Devon, between 1965 and 1968. The fishing power of each vessel was calculated from its catchrate of total demersal species and of plaice by comparison with a standard group using a modification of Gulland's (1956) method . Fishing power of individual vessels varied with time (the average trend was upwards) as a result of a factor (or factors) which had not been included in the analyses. If the regression equations were used to predict fishing power the result would be biased .

00020

Loftus, K.H.
Science for Canada's fisheries rehabilitation needs

- (En; en, fr)

J.Fish.Res.Board Can. - (1976) - 33(8), 1822-1857

/reviews/ /population dynamics/ /abundance/ /fishery management/ /salmonidae/ /ANW,Canada/ /INE,Canada/ /coastal fisheries/. A brief, generalised review of the current status of salmonid fisheries on the west and east coasts, and of selected representative waters in the freshwater area, is presented. It is concluded that many fish communities and/or fish stocks are depressed, collapsed, or extinct as a result of severe stress imposed directly, or indirectly, by man's activities. Rehabilitation of stocks will require additional science in areas such as hatching, rearing and selective breeding, fishery engineering, and in the more precise definition of natural productive capacity of waters.

00021

Margetts, A.R. (ed)
Hydro-acoustics in fisheries research. A symposium held in Bergen 19-22 June 1973

- Symposium on acoustic methods in fisheries research - Bergen (Norway) - 19 Jun 1973 - 327 p. - 42 papers - (En; en)

Rapp.P.-V.Reun.CIEM - (1977) - 170

A /collection of papers/ presented at the /Symposium/ dealing with /echo sounders/ and other /acoustic equipment/ used for /fishery surveys/ and other aspects of /fishery research/.-Includes information on the use of acoustics in /stock assessment/ and the study of fish /population characteristics/ with particular attention to technical details. Includes also papers on /acoustic holography/ and surveys of particular stocks, notably off the /North America/ and /South America/ coasts .

00022

McCall, A.D.
Density dependence of catchability coefficient in the California Pacific sardine, Sardinops sagax caerulea, purse seine fishery

- CALCOFI Conference - Santa Barbara, CA (USA) - 12 Nov 1974 - (En; en)

Rep.CCOFI - (1976) - 18, 136-148

/catchability/ /catch per unit effort/ /pelagic fisheries/ /ISE,USA, California/ /fishing mortality/. The California Pacific sardine fishery is examined for the period 1932 to 1950 to determine if the catchability coefficient, based on available measures of fishing effort, varied as a function of population size. Previous estimates of sardine fishery parameters indicate such a density dependence. New estimates of instantaneous fishing mortality rates and mean population sizes were calculated. Annual mean boat tonnages for the fleet were calculated and show a growth in mean effective vessel capacity from about 60 tons in early 1930's to 120 tons in 1946. To account for changes in efficiency of the fleet due to increases in vessel size, fishing effort in boat-months was converted to effort in ton-months . Two catch per unit effort indices of abundance, one unstratified by geographical area and one stratified into northern and southern segments of the fishery, gave very similar results. Estimates of the catchability coefficient for the sardine fishery were found to be inversely related to population abundance, N, and fit the power function q alpha.N to the power beta, with beta -0.611 for the period 1937-1944 when the fishery was least restricted and year improvements were minimal .

00023

McCracken, F.D. Macdonald, R.D.S.
Science for Canada's Atlantic inshore seas fisheries

- (En; en, fr)

J.Fish.Res.Board Can. - (1976) - 33(9), 2097-2139

/fishery sciences/ /coastal fisheries/ /marine fisheries/ /fishery management/ /ANW,Canada/. This study is a sequel to 'Science for Canada's Shelf Seas fisheries' by Regier and McCracken (1975). The authors attempt to identify the science effort necessary to help resolve the problem of making decisions about many small fisheries-based communities. Particular attention is paid to the east coast of Newfoundland and Labrador and the st.Lawrence Gulf. Managing the aquatic resources of the latter must have a high priority. Science needs are seen in the perspective of a manipulative socio-political subsistence system which perpetuates high unemployment, low income and much dependency on government. Changes in social science activity will also be necessary. Community development is of critical importance, as is increased representation in fisheries decision-making.

00024

Miller, R.J.
North American crab fisheries: regulations and their rationales

- 4 ref. - (En; en)

Fish.Bull.NOAA/NMFS - (1976) - 74(3), 623-633

/Fishery management/ /Fishery regulations/ /Shellfish fisheries/ /Marine fisheries/ /reviews/ /conservation of resources/ /processing fishery products/ Because of similarities in species' life histories, fishing and processing methods, economics of fishing and processing, and political systems among jurisdictions, managers of North American crab fisheries share many common problems. This review is presented to suggest options to those delegated the responsibility for managing crab fisheries. Regulations are grouped into management problems of 1) conservation, 2) allocation of landings among commercial fishermen, 3) stability of landings, 4) conflict over grounds or resource, 5) processing economics, and 6) administration. A final section discusses procedures in eight jurisdictions by which public or government representatives may effect changes in regulations .

00025

Payne, A.I.
The exploitation of African fisheries

- invited paper in the series 'Ecology and Development' - (En; en)

Oikos - (1977) - 27(3), 356-366

/lake fisheries/ /river fisheries/ /fishery development/ /exploitation/ /africa/ /Victoria L./ /inland fisheries/ /yield/ /freshwater aquaculture/ /marine fisheries/ /multispecies fisheries/ /Sarotherodon esculentus/. L.Victoria is used as a case study to demonstrate how overfishing of some stocks, e.g. Sarotherodon esculentus, has occurred, how it could have been predicted by conventional models developed from temperate demersal fisheries, and how the situation could be improved. The difficulties of assessing mutispp fisheries, i.e. where the whole community is exploited, are dealt with particularly in relation to proposed trawling operations in the lakes. conflict between trawl and artisanal fisheries seems inevitable. Some shortcomings of fish culture and stocking programmes are discussed, and attention is drawn to the increased activities of dealers in ornamental fish and the emerging pollution problem. The importance of developing long range capability is emphasised.

00026

Pope, J.G.
The effect of biological interaction on the theory of mixed fisheries

ICNAF--75/IX/127 - 7.Special Commission Meeting ICNAF - Montreal (Canada) - Sep 1975 - (En)

Sel.Pap.ICNAF - (1976) - (no. 1), 157-162

/fishery management/ /stock assessment/ - /mixed fisheries/ /multispecies fisheries/ /potential yield/. The author considers the interactions between stocks, commencing with interactions between spp. and proceeding to examples of interactive mixed fisheries. The implication of the theory to management of mixed fisheries is discussed. It is concluded that the total yield from an interactive system would be lower than the sum of the individual spp' MSYs .

00027

Radovic, J. Isaacs, J.D. Rothschild, B.J.
Fishery science: fact, fiction, and dogma

- Symposia of the CALCOFI Conference. A. Fishery science: fact, fiction, and dogma - San Clemente, CA(USA) - 4 Nov 1973 - (En)

Rep.CCOFI - (1976) - 18, 31-48

This section of three papers presented at the /conference/ contains texts discussing general aspects of /fishery science/, one by each of the three authors. These deal principally with the underlying theory and the ways in which it has developed .

00028

Regier, H.A.
Environmental biology of fishes: emerging science

- (En)

Environ.Biol.Fish. - (1976) - 1(1), 5-11

/fishery biology/ /fishery sciences/ /ecology/. Two pairs of interactive sequences are outlined, the first showing 6 idealised stages in fishery development or 'maturation', the second in respect of abiotic resources. The concept of Most Profitable Stocks (mpss) is introduced as the 'maximum difference between what the fishing enterprise receives for its landed catch of particular stocks, less the corresponding costs of fishing for them.' Four ecological paradigms are also discerned, Linnean taxonomy including natural history, population ecology including dynamics, ecological systems including taxocenes and ecosystems, and ecological engineering and therapeutic ecology.

00029

Roettingen, I.
On the relation between echo intensity and fish density

- (En; en)

Fiskeridir.Skr. (Hav unders.) - (1976) - 16(9), 301-314

/methodology/ /echo surveys/ /echosounding/ /stock assessment/ /population density/ - /Pollachius virens/ /Sprattus sprattus/. Integrated echo intensities for a wide range of fish densities were measured. The experiments were carried out on live saithe (Pollachius virens) and sprat (Sprattus sprattus) which were kept in a net cage. Echo intensities were measured at 38 kHz and 120 kHz and pulse lengths ranging from 0.1 ms to 0.6 ms. The echo intensity was proportional to fish density below certain density limits. At high fish density a shadowing effect was observed. Factors encountered during survey work on schooling fish which indicate shadowing are also discussed. The exact density values at which shadowing occurs, appear to depend on parameters such as fish sp, size, orientation, and probably also the vertical extention of the school .

00030

Saunders, M.J. Morgan, A.J.
Fishing power, fishing effort, density, fishing intensity and fishing mortality

- (En; en)

J.Cons.CIEM - (1976) - 37(1), 36-40

/fishing effort/ /fishing power/ /fishing mortality/ /fishing gear/ /fishing vessels/ /catch per unit effort/. This paper derives relationships between fishing power, fishing effort, density, fishing intensity and fishing mortality. Each of the concepts is defined. Fishing power is difficult to measure, so the concept of relative fishing power as a measurable quantity is introduced. This leads to a discussion of relative fishing effort, relative density and relative fishing intensity. The latter is pptnl. to fishing mortality and can be used to record changes in fishing mortality. If the constant of proportionality, the catchability coeff., is measured, the relative fishing intensity can be used for direct estimation of fishing mortality.

00031

Sissenwine, M.P.
The effect of random fluctuations on a hypothetical fishery

ICNAF--76/VI/34 - 26.Annu.Meeting ICNAF - Montreal (Canada) - 31 May 1976 - (En; en)

Sel.Pap.ICNAF - (1977) - (no.2), 137-144

/mathematical models/ /simulation/ /population number/ /fishing mortality/ - /Schaefer model/. The Schaefer (1954) stock-production model was stochastically simulated numerous times for several combinations of the ratio of maximum equilibrium catch (CEmax) to maximum population size, the ratio of initial population size to maximum population size, the variance of deviations from the model, the autocorrelation of the deviations and the rate of fishing mortality. The results indicate that the long-term average catch is likely to be below CEmax for realistic values of the variance of the deviations from the model . The probability of a population declining to extremely low levels increases as the autocorrelation of the deviations increase. The variability of the catch decreases when fishing mortality declines below the rate that would produce the maximum equilibrium catch for the deterministic version of the Schaefer model .

00032

Taubert, B.D. Coble, D.W.
Daily rings in otoliths of three species of Lepomis and Tilapia mossambica

- (En; en, fr)

J.Fish.Res.Board Can. - (1976) - 34(3), 332-340

/otolith reading/ /aging methods/ /Lepomis gibbosus/ /Lepomis cyanellus/ /Lepomis macrochirus/ /Tilapia mossambica/. Daily rings formed on otoliths of known-age, laboratory-raised pumpkinseed (Lepomis gibbosus), green sunfish (L. cyanellus), bluegill (L. macrochirus), and mozambique mouthbrooder (Tilapia mossambica) for at least 176, 170, 125, and 60 days, respectively. Subdaily rings found in young laboratory and wild fish were easily distinguished from daily rings. Width of daily rings on otoliths of green sunfish was linearly related to daily increase in length of fish, but the number of rings was a product of age of fish only, not length of fish or otolith radius. Growth and daily ring formation on otoliths in wild bluegill and largemouth bass (Micropterus salmoides) appeared to be similar to those in laboratory-raised fish . Otoliths of green sunfish held under simulated winter conditions ceased to produce daily rings, but did form an annulus. Two kinds of otolith tissue were present in most of the larger laboratory fish and wild bluegill but were not observed in wild largemouth bass. The first type, present in all areas of the otolith except the extreme posterior end, was translucent and had well-defined daily rings. The second type, present only in the posterior end, was opaque and had poorly etched daily rings that were difficult to discern. Both tissues were calcium carbonate in the aragonite form. Daily rings were found on otoliths of fish held at constant temperature . Results of experiments with young mouthbrooders held under various light-dark and feeding cycles suggested that a 24-h light-dark cycle that entrained an internal, diurnal clock was required for daily ring production .

00033

Tiews, K.
[Fishery research and its significance for fishery management] Die Fischereiforschung in ihrer Bedeutung fuer die Fischwirtschaft

- (De)

Fischwirtschaft - (1975) - (no. 14), 21-36

/fishery research/ /fishery development/ /Germany, Fed.Rep./ - /Krill/ /Euphausia superba/ /ANE, North Sea/ /ANE, Baltic/. In German fishery research, routine biological control of the main commercial fish stocks in the N. Atlantic, the North Sea and Baltic, plays a dominant role. Study and opening up of new catch areas and development of new spp are of principal importance. The krill (Euphausia superba) is of particular interest in this field. Other main spheres of research include development of new fishing techniques, aquaculture and processing of products used in fishery management .

00034

Tiews, K. (ed)
International Seminar on Fisheries Resources and their Management in Southeast Asia, Berlin(Germany, Fed.Rep.)
Proceedings of the International Seminar on Fisheries Resources and their Management in Southeast Asia, Berlin, 19 November to 6 December, 1974

- Int. Seminar on Fisheries Resources and their Management in Southeast Asia - Berlin(Germany,Fed.Rep.) - 19 Nov 1974 - Hamburg(Germany,Fed.Rep.) - German Foundation for International Development - 1976 - 522 p.
- (En; en)

This volume represents the published proceedings of the /conference/ held in Berlin. It contains the texts of about 50 papers on /fishery resources/ of /Southeast Asia/, /fishery management/ and /fishery development/. Details are also given of some nonconventional /fishery products/. Papers included relate to /marine pollution/, /aquaculture/, and present status of fisheries. Country papers are given for /Bangladesh/, /Hong Kong/, /Iran/, /Malaysia/, /Pakistan/, the /Philippines/, /Singapore/, /Sri Lanka/ and /Viet Nam/. Species which are considered in depth include /Katsuwonus pelamis/ (skipjack), /Stolephorus heterolobus/, /Eucheuma/, /Rastrelliger neglectus/, and /Psettodes enumei/ .

00035

Tillman, M.F. Stadelman, D.
Development and example applications of a simulation model of the northern anchovy fishery

- (En; en)

Fish.Bull.NOAA/NMFS - (1976) - 74(1), 118-130

/pelagic fisheries/ /marine fisheries/ /Engraulis mordax/ - /models/ /simulation/ /computers/. A computer simulation model of the reduction fishery for northern anchovy, Engraulis mordax, is described. The biological subroutine of this model is an age-structured paradigm which is modified to account for age-dependent exploitation and variable recruitment. To demonstrate the model's utility 2 example applications are presented which provide insight into the problems of evaluating alternative regulations while lacking perfect knowledge of economic or biological behavior. The model's current value lies in its use as a tool to identify research needs .

00036

Troadec, J.-P. Boerema, L.K. Clark, W.G.
Cadima, E.L. Laurec, A. Fonteneau, A.
Jones, R. Garcia, S.
FAO/CNEXO Training Course on Stock Assessment Methods, Brest (France)
[Models for the evaluation of aquatic stocks. Annex to the Report of the second FAO/CNEXO Training Course on Stock Assessment Methods, Brest, Brest (France), 26 July - 27 August 1976] Les modeles d'evaluation des stocks halieutiques. Annexe au rapport sur le Second Stage FAO/CNEXO de formation sur les methodes d'evaluation des stocks halieutiques, Brest (France), 26 juillet - 27 aout 1976

FAO-FIRS/C701 - FAO/CNEXO Training Course on Stock Assessment Methods - Brest (France) - 26 Jul 1976 - Rome (Italy) - FAO - 1977 - 164 p. - includes glossary, p. 163-4 - (Fr)

FAO Circ.Peches - (no. 701)

/conference/ /stock assessment/ /methodology/ /training centres/ /population dynamics/ - /Ricker model/. Papers deal with stocks and their reactions to different levels of exploitation, models, including the various types available such as Ricker's exponential model, the formulation of models, and other methods of stock assessment. The latter include semi-quantitative methods, the use of marking and population dynamics data. One paper also reviews requirements for data collection. An English-French glossary is included .

00037

Veen, J.F. de
On changes in some biological parameters in the North Sea sole (Solea solea L.)

- (En; en)

J.Cons.CIEM - (1976) - 37(1), 60-90

/population dynamics/ /fecundity/ /size distribution/ /environmental effects/ /Solea solea/ /ANE, Netherlands/ - /fishing effort/ /fishing gear/. Biological parameters such as length and weight-at-age, fecundity and length at first maturation, derived from market sampling in Dutch ports, showed significant changes in the period under observation 1957-1973. An attempt was made to correlate these changes with environmental factors such as the density of the sole stock, temperature in the growth-season, eutrophication, and fishing effort. Of these factors significant correlations were only found with fishing effort and with indices of the disturbance of bottom layers by active gears. Additional evidence points to the possibility that the amount of beam-trawling with chains has a positive effect on the growth rate and on other biological parameters of the sole .

00038

Walter, G.G.
Non-equilibrium regulation of fisheries

ICNAF--75/IX/131 - 7.Special Commission Meeting ICNAF - Montreal (Canada) - Sep 1975 - (En)

Sel.Pap.ICNAF - (1976) - (no. 1), 129-140

/yield/ /biomass/ /fishery management/ /fishing effort/. The author studies the yield of a fishery under non-equilibrium conditions and compares strategies for bringing the stock size to that required for maximum sustainable yield. He also considers reduction to this optimum stock size from above as well as increase from below. A procedure is introduced, based on Shaefer's equation which assumes the growth rate of the total stock biomass to be a function of the biomass itself and of fishing effort. Although no delayed effects are present in the equation it is seen that there is a considerable delay between the initiation of a regulation and the attainment of the desired equilibrium state .

00039

Wilimovsky, N.J.
Obtaining protein from the oceans: opportunities and constraints

- 41.North American Wildlife and Natural Resources Conference - [n.p.] - [n.d.] - (En)

Trans.N.Am.Wildl.Nat.Resour.Conf. - (1976) - (no.41), 58-78

/fishery management/ /fishery development/ /fishery resources/ /exploitation/ - /krill/. The author assesses the status and future of resource management, and reviews the present and potential contribution of the ocean to world protein supply, suggesting some opportunities for, as well as constraints on, the utilization of aquatic resources. The potential of living resources is assessed on the basis of (1) their present contribution to the world supply of protein, (2) the factors influencing this input, positive and negative, (3) the trends in the harvest, (4) their processing, and (5) their future. Particular attention is paid to the present yield level, the trends in world harvest, and the level of exploitation in comparison with that of agriculture. Some stocks which could be exploited further are noted, krill, grenadier, lanternfish and squid, and the potential of aquaculture is briefly considered . The reduction of waste, improvement of gear and cooperation in fishing are also ways by which the level of protein obtained could be increased. Socio-economic-legal opportunities and constraints are discussed, including eating habits, resource control and management, data requirements and monitoring of resource use on a real-time basis, choice of management objectives, models for management, and the concepts of resilience and stability in resource management. Management techniques which are considered include natural experimentation and food web manipulation. The effects of contaminants are noted and the conflicts arising out of recreational use of the oceans, energy conversion and human resource requirements are briefly reviewed .

00040

Welcomme, R.L.
FAO Committee for Inland Fisheries of Africa, Rome (Italy)
The fisheries ecology of African floodplains

FAO-CIFA-T--3 - Rome (Italy) - FAO - May 1975 - 51 p. - (En; en)

CIFA Tech.Pap. - (no.3)

/flood plains/ /inland fisheries/ /freshwater ecology/ /fishery development/ /Africa/. The ecology of flood plains in general is discussed. Because of the great conc. of fish occurring during migrations onto and off the flood plain, and in flood plain pools during the dry season, the fisheries of some African flood plains are among the most important of the continent. In addition the rivers are used for other, sometimes conflicting purposes, such as dams or irrigation schemes. The effects of industrial or agricultural activity may also act adversely on the fisheries, though it is still only a threat to the african flood plains. Management of flood plains as a multipurpose resource is necessary, but first requires intensified studies of both a theoretical and a practical nature.

00041

Zarasov, A.V.
[Dynamics of commercial fish population abundance] Dinamika chislennosti promyslovykh ryb

- Moscow (USSR) - Pischevaya Promyshlennost' - 1976 - 312 p. - (Ru; ru)

/population dynamics/ /recruitment/ /population growth/ /mortality/ /potential yield/ - /biographies/. This monograph deals with the study of regularities in variations of major factors governing the abundance of commercial populations: recruitment, growth, natural and fishing mortality. Particular consideration is given to natural and fishing mortality, relationship between the size of the spawning population and recruitment, and to the effect of changes in the intensity of fishing on the size of stocks and potential yields. The volume brings together the latest advances in the fishery science and contains the results of the author's own research. It is prefaced by a brief account of the late author's life and career .

00042

Zweifel, J.R. Lasker, R.
Prehatch and posthatch growth of fishes - a general model

- 29 ref. - (En; en)

Fish.Bull.NOAA/NMFS - (1976) - 74(3), 609-621

/development(biological)/ /fish eggs/ /fish larvae/ /growth/ /mathematical models/ /temperature effects/. The developmental stages of fish eggs and the growth of larval fishes or several species can be represented by a Gompertz-type curve based on the observation that in wildely different living systems, exponential growth tends to undergo exponential decay with time. Further, experimental studies and field observations have shown that the effect of temperature on the growth process follows the same pattern, i.e., the rate of growth declines exponentially with increasing temperature. Evidence suggests that prehatch growth rates determine ideal or optimum trajectories which are maintained after hatch in the middle temperature range but not at either extreme .